

GEOPHYSICAL SUBSURFACE PROFILING OF KUANTAN BAUXITE FORMATION

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STUDENT'S DECLARATION

I hereby declare that the work in this thesis is based on my original work except for quotations and citations which have been duly acknowledged. I also declare that it has not been previously or concurrently submitted for any other degree at Universiti Malaysia Pahang or any other institutions.

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FORMATION

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ABSTRAK

Kajian ini memberi tumpuan kepada profil bawah tanah geofizik pembentukan bauksit Kuantan. Pada masa lalu, pensampelan konvensional, lubang gerek yang digabungkan dengan Mackintosh Probe (MP) digunakan untuk tujuan untuk menyiasat permukaan bawah tanah. Walau bagaimanapun, MP adalah sangat mahal dan mengambil masa yang lama. Objektif kajian ini adalah untuk mengkaji kaedah geofizik untuk menentukan profil bawah permukaan dengan menggunakan imej rintangan dan untuk mengaitkan data rintangan elektrik dan MP. Hasil profil gambar menunjukkan bahawa ketahanan tanah bergantung pada jenis tanah dan pembentukan tanah. Oleh itu, profil imej yang dijana oleh perisian menunjukkan pengimejan bawah tanah geofizik dalam maya. Data dari hasil ujian MP ditabulasi untuk mewakili kekerasan tanah dan data rintangan elektrik diinterpretasikan untuk mengaitkan kedua-dua hasil tersebut. Korelasi ini bergantung pada kedalaman dari permukaan tanah terhadap jumlah ketukan mackintosh dan rintangan tanah. Semakin besar nilai rintangan, lebih banyak ketukan mackintosh. Ia dapat menyimpulkan bahawa peningkatan rintangan selari dengan ketukan mackintosh.

ABSTRACT

This research focuses on the geophysical subsurface profiling of Kuantan bauxite formation. At the past time, the conventional, borehole sampling incorporated with Mackintosh Probe (MP) is used for a purposed to investigate the subsurface of the soil. However, the MP is very costly and lengthily. The objective of this research is to study the geophysical method to determine the subsurface profile by using resistivity image and to correlate the data of electrical resistivity and MP. The result of image profile was illustrated that the resistance of soil is depended on type of soil strata and soil formation. As a result, the image profile generated by the software demonstrated in virtual the geophysical subsurface soil imaging. The data from results of MP test was tabulated to represent the hardness of the soil and the data of electrical resistivity was interpreted to correlate with the both result. The correlation intersection is depended on the depth from ground surface against the number of mackintosh blows and soil resistivity. The more the value of resistivity, the more the Mackintosh blows. It can conclude that the resistivity increase proportional with mackintosh blows.

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LIST OF SYMBOLS

Al(OH)_3	Gibbsite
AlO(OH)	Boehmite and Diaspore
Al_2O_3	Alumina
Fe_2O_3	Iron oxide
SiO_2	Silica
Ω_m	Ohm.m
R^2	Coefficient of Determination

LIST OF ABBREVIATIONS

SI	Site Investigation
ERI	Electrical Resistivity Imaging
MP	Mackintosh Probe
SPT	Standard Penetration Test
DC	Direct Current
GPS	Global Positioning System
RL	Resistivity Line

CHAPTER 1

INTRODUCTION

1.1 Introduction

Bauxite refers to any ore or mixture of minerals consisting of iron and aluminum hydroxides/oxides. The ore in most instances comprise of minerals such as gibbsite $[\text{Al}(\text{OH})_3]$, diaspore and boehmite [both $\text{AlO}(\text{OH})$] (Plunkert, 2000). A bauxite body which is economically mineable at present or in the foreseeable future, currently should have chemical composition of $>45\% \text{ Al}_2\text{O}_3$, $<20\% \text{ Fe}_2\text{O}_3$ and $<5\% \text{ SiO}_2$ (Gow & Lozej, 1993). Malaysia is now the world's top producer of bauxite.

One of the largest bauxite productions in Malaysia is located in state of Pahang including the Kuantan area. Figure 1.1 shows the location of bauxite in Kuantan which is located at Felda Bukit Goh.



Figure 1.1: The location of Felda Bukit Goh in Kuantan

In 2014 and 2015, bauxite area became a mining place to get the minerals such as boehmite and gibbsite that can be extracted to become aluminium. However, in Kuantan, mining activity was banned by the government because of the majority of the miners do not follow the right procedure to operate the mining process. Therefore, some companies want to harness the mining region as a development area in addition to overcome the limitation of residential area in Kuantan. So, site investigation (SI) should be conducted to determine the soil information of the bauxite area.

Site investigation is very important to get the information and data related to the site that normally compiled into a report that known as site investigation (SI) report. Therefore, the most suitable SI method should be identified according to the condition of the site. For example, when doing site investigation at a bauxite site in Kuantan, geophysical method can be proposed as an alternative method for site investigation. Figure 1.2 shows a bauxite site in Kuantan.



Figure 1.2: A bauxite site in Kuantan

This study is carried out as a preliminary assessment of geophysical survey for subsurface profiling. The purpose is to determine the profiling of the soil and probably the extent of the bauxite deposit under the ground surface for the future use.

1.2 Problem Statement

Nowadays, majority of bauxite site in Kuantan becomes construction area due to the residential and commercial need. Therefore, site investigation should be carried out at the area to get the important information and data before the engineer can design a foundation and other structures of the building.

The current practice that is used to obtain the information is by borehole drilling. To ensure that the drilling work is cost effective, it is very important that the location and depth are well planned and optimised to meet construction requirements and ground conditions. A borehole will provide single point data of the subsurface which is needed for the site investigation report. The data will be more accurate if the number of the drilling borehole is increased, but it will risk the cost of the site investigation process. Therefore, there is a geophysical method to overcome the problem which is Electrical Resistivity Imaging (ERI).

ERI is a measurement of ground resistivity involves passing an electrical current into the ground using some equipment such as electrode and transmitter. This method will provide a continuous profile of the subsurface along the survey line. Therefore, site investigation data will be obtained easily with cost effectively.

Based on the above problem, this study is carried out to investigate the subsurface of the bauxite deposit area in Kuantan using ERI. The method of Mackintosh Probe (MP) will also be carried out at few points along the resistivity line.

1.3 Objectives of Study

The objective of this study is to address important issues pertaining to the above mentioned problems which are listed as follows:

- 1) To determine the profiling of the bauxite site in Kuantan
- 2) To correlate between the resistivity and MP number of blows of the bauxite site in Kuantan

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